

# Daubert: U.S. v. Douglas D. Smith, DNM Case No. 18- CR-3495 JCH

Theodore J. Chavez

Physical Scientist / Forensic Examiner

FBI Laboratory

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1

GOVERNMENT  
EXHIBIT  
**2**

# Trajectory Analysis



Projectile paths can be important in determining the physical origins of gunshots and location of additional evidence.



Over relatively short distances, projectile trajectories can be represented by a straight line not withstanding deflection or ricochet.



A projectile path consists of both the line and direction along which a projectile travels.



At least two points of reference are generally needed to establish a path; however, a single hole may sometimes be used to estimate a path based on the associated shape, relative dimension, depth and/or trace deposits.

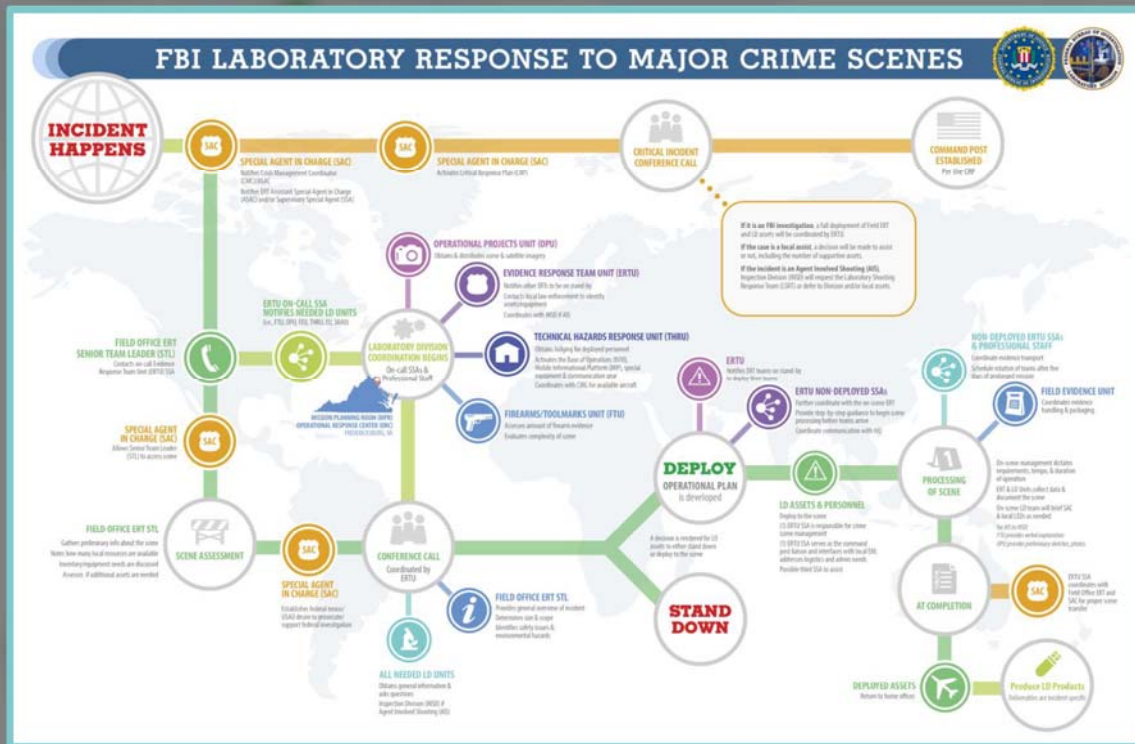


Direction of travel can sometimes be determined from the shape and characteristics of an impact mark, as well as from bullet material deposition.

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2

# Workflow Management for Shooting Incidents



The Laboratory Shooting Reconstruction Team (LSRT) is a group of specialized subject matter experts (SMEs) qualified in shooting incident reconstruction. The team utilizes reconstruction equipment along with specialized techniques that comply with established FBI Laboratory protocols and procedures. Members of the LSRT include personnel from the **Evidence Response Team Unit (ERTU)**, **Technical Hazards Response Unit (THRU)**, **Operational Projects Unit (OPU)**, and **Firearms/Toolmarks Unit (FTU)**. The LSRT is trained and experienced in working complex crime scenes and is available to deploy from Quantico, Virginia, to integrate with respondents at the incident site.

## PROCESSES PERFORMED:

**Shooting Incident Reconstruction (SIR)** - The examination and documentation of bullet holes (perforations), impacts, and ricochets (skips) to determine if there is a relationship between them that would indicate the path a bullet would have traveled.

**Crime Scene Documentation** - The process of fully documenting a crime scene and its related evidence using advanced photographic techniques and digital documentation methods (i.e., surveying, laser scanning, 3D scans, etc.). Data and information collected on scene is later processed and combined to create accurately scaled diagrams, 3D models, and other visual products for use as investigative aids or courtroom exhibits.

## DEPLOYMENT PROCESS:

**Notification Phase** - Notification begins immediately when a shooting incident occurs.

- The SAC will also notify the Inspection Division (INSD) if the incident is an Agent Involved Shooting (AIS).
- The Field Office ERT Senior Team Leader (STL) alerts the ERTU On-Call SSA of the incident.
- ERTU notifies FTU, OPU, THRU, and the Field Evidence Unit (FEU).
- ERTU notifies other ERTs to be on stand by, if the scene is large scale.

**Coordination Phase** - Once notified, the ERT STL will deploy to assess the scene, while the SAC establishes a federal nexus. Following scene assessment, a conference call is held with the LSRT (ERTU, FTU, OPU, THRU) and Field Office ERT STL. (INSD participates if incident is an AIS.)

**If case is FBI**, full deployment of Field ERT and LO assets will be coordinated by ERTU.

**If case is a local assist**, a decision will be made to assist or not, including the number of supportive assets.

**If incident is an AIS**, INSD will request the LSRT or defer to Division and/or local assets.

**Deployment Phase** - The LSRT deploys to the shooting incident to document forensic evidence.

- ERTU deploys stand by teams, as needed.
- THRU coordinates with the Critical Incident Response Group Field Flight Operations for aircraft availability and will facilitate travel logistics for the team.
- THRU activates the Base of Operations (BOO), the Mobile Imaging Platform (MIP), and support vehicles. THRU also coordinates delivery of specialized equipment and communications gear from one of the Operational Response Centers in Fredericksburg, VA; Irving, TX; or Northridge, CA.
- OPU distributes scene satellite imagery.
- FTU preliminarily assesses amount of firearms evidence and evaluates complexity of scene.

**Documentation Phase** - The LSRT uses specialized tools and equipment to accurately document the crime scene. On scene management dictates requirements, tempo, and duration of the operation. The LSRT will brief, as needed, SAC and local LO managers. Upon completion, ERTU SSA coordinates with SAC and Field ERT and collects scene to SAC. Assets return to home offices, and now deployed ERTU SSA coordinates evidence transport to Quantico.

## RESULTS:

The LSRT provides a briefing on scene to the Field Office, with information pertaining to the shooting incident. If the incident is an AIS, the LSRT will provide a general overview of the incident, sketches, optical photos, and scan data prior to departure from the scene.

After returning to the Laboratory Division and once all scans are completed:

- FTU will provide a Shooting Incident Reconstruction Report.
- OPU will provide graphics and supporting trial exhibits, working with FTU examiner and trial team.

Completed LSRT products and deliverables can be expected within 12 months for most cases; deliverables for AIS related cases will be provided to INSD within 90-120 days.



# Shooting Incident Management

- Conference Call
- Mission Plan
- Operational Plan
- Scene Deployment
- Laboratory Products



# FBI Laboratory Team

Observation	Imaging	Measurement
<b>Firearms/Toolmarks Unit (FTU)</b> <ul style="list-style-type: none"> <li>Physical Scientist Examiner</li> <li>Physical Scientist Non-Examiner</li> </ul>	<b>FTU</b> <ul style="list-style-type: none"> <li>Analysis of Defects</li> <li>Identify entrance/exit</li> </ul>	<b>FTU</b> <ul style="list-style-type: none"> <li>Hand measurement</li> </ul>
<b>Operational Projects Unit (OPU)</b> <ul style="list-style-type: none"> <li>Visual Information Specialist</li> <li>Photographer</li> </ul>	<b>OPU</b> <ul style="list-style-type: none"> <li>Photography</li> <li>Aerial imaging</li> <li>Videography</li> </ul>	<b>OPU</b> <ul style="list-style-type: none"> <li>Hand Measurement</li> <li>Survey Data</li> <li>Scan Data</li> </ul>
<b>Evidence Response Team (ERT)</b> <ul style="list-style-type: none"> <li>Special Agent</li> <li>Support Personnel</li> </ul>	<b>ERT</b> <ul style="list-style-type: none"> <li>Photography</li> <li>Aerial imaging</li> <li>Videography</li> </ul>	<b>ERT</b> <ul style="list-style-type: none"> <li>Hand Measurement</li> <li>Survey Data</li> <li>Scan Data</li> </ul>

## Trajectory Analysis

- Measurement of bullet impact and angle; analysis of the projectile defects, identification of entrance/exits, evaluation of the interactions of the projectiles and their targets.
- Imaging (e.g., photography, videography)

# Trajectory Analysis



(1) whether the theory or technique in question can be and has been tested;



(2) whether it has been subjected to peer review and publication;



(3) its known or potential error rate;



(4) the existence and maintenance of standards controlling its operation; and



(5) whether it has attracted widespread acceptance within a relevant scientific community.

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6

(1) whether the theory or technique in question can be and has been tested;

- Competency Testing
  - Training Program
- Proficiency Testing
  - Accredited Forensic Test Providers
  - Scope of Forensic Accreditation
- Validation Studies
- Empirical Studies



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7

## (2) whether it has been subjected to peer review and publication;

- Peer Reviewed Publication
  - Textbooks, military training guides, and journals
- Association of Firearm & Tool Mark Examiners (AFTE)
  - AFTE Journal
- American Academy of Forensic Sciences (AAFS)
  - Journal of Forensic Sciences
- International Association of Identification (IAI)
  - Journal of Forensic Identification



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## (3) its known or potential error rate;

- Measurement Uncertainty
  - Created during the process of measuring
- Directionality
  - Incorrect determination of a trajectory
  - Proficiency Tests provide information on examiner performance/decision(s)
- Mitigate Human Error
  - Quality Assurance review process



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9

## (4) the existence and maintenance of standards controlling its operation; and

- Comprehensive Training Program
  - Training Manual, Competency Test, Qualification
- Quality System
  - Laboratory Operations Manual
  - Standard Operating Procedures
  - Review of Supporting Records, Report, and Supplemental Graphics
    - Technical Review
    - Administrative Review
- Accreditation Programs



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10

(5) whether it has attracted widespread acceptance within a relevant scientific community.

- Association of Firearms and Tool Mark Examiners (AFTE)
- Academic Programs
- Grant Programs
  - National Institute of Justice
  - National Institute of Standard and Technology (NIST)
- Accepted Measurement Techniques
  - Land Surveying Equipment and Tools



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11

# Laboratory Division Results

## Firearms/Toolmarks

- Laboratory Report
  - Summary of Team
  - Analysis of Projectile Defects
  - Bullet Trajectories
    - Number of Shots
    - Directionality of Projectile
    - Evaluation of the interactions of the projectiles and their targets
  - Supplemental Graphics

## Operational Projects

- Graphics
  - Two Dimensional
    - Overhead Perspective
    - Side Elevation View
- Exhibits



# Trajectory Analysis – Overhead Perspective

